

GRAPHICS CARDS

INTRODUCTION

The 3D graphics in PC games keep getting better, but this is both a blessing and a curse. On the plus side, fancy new graphical effects mean that characters and environments in the latest games look more realistic than ever. The downside is that your current graphics card may not support all the newest features, and may not be powerful enough to play the latest games smoothly.

One of the joys of owning a PC, though, is that they're easy to upgrade. Fitting a new graphics card is simple, and will allow you to play all the latest games in glorious detail. In this month's Labs we've gathered 18 cards ranging from £45 to £352. Whether you want to play the latest games on a tight budget or take on the next generation of DirectX 10 titles, we'll help you to find the ideal card at a great price.

Chris Finnamore

Components and handhelds expert

chris@computershopper.co.uk



PICK A CARD

As 3D games get better and better, your old graphics card may have trouble keeping up. We test 18 of the latest cards to find the perfect match for your PC

Choosing a... Graphics Card

There's more to getting the right graphics card than simply buying the most expensive one. You don't necessarily need to spend over £300 to get a card that suits your gaming needs. You should also consider what components your PC currently has, as you may need to upgrade them to take advantage of the most powerful cards. Our guide will help you work out what kind of card you need, and explains whether you need any other components to go with it.

IF THE SLOT FITS

All modern graphics cards fit into the PCI Express x16 slot on your motherboard. PCI Express replaced the AGP standard in 2004, and provides up to four times the bandwidth of AGP. Graphics cards based on the obsolete AGP standard are now few and far between, so if you have an AGP motherboard and want to play modern games, you'll need to upgrade it.

A more recent change in graphics technology is the introduction of DirectX 10. DirectX is a standard that enables programmers to create games that work on all the millions of different PCs in the world. DirectX 9 was released in 2002, and most current games use it. DirectX 10 is a new standard, released at the same time as Windows Vista. It adds some impressive new effects

that can make games more lifelike, but to use it you'll need Windows Vista, a DirectX 10 graphics card and a game that supports the new standard.

We've yet to see a commercial game that supports DirectX 10, and we expect DirectX 10 games to include DirectX 9-compatible versions for the foreseeable future. If you're a keen gamer who wants the very best graphics you should pick a card that supports DirectX 10, but for casual or occasional gamers a DirectX 9 card will give great results for some time to come.

THE NEED FOR SPEED

There are several factors that govern how quickly a graphics card can create 3D graphics, and DirectX 9 and DirectX 10 graphics cards work in different ways. DirectX 9 cards have a number of vertex pipelines, pixel pipelines and texture processors. Vertex pipelines translate a 3D image described as thousands of polygons into a 2D image that can be shown on the screen, while pixel pipelines and texture processors add colour and texture information. The graphics card has a central graphics processor, sometimes referred to as a GPU, that runs at a set clock speed expressed in megahertz per second. Each pipeline and processor can perform one operation every clock cycle, so in theory





the more pipelines and processors the card has and the faster the clock speed, the faster it can render 3D images.

The latest DirectX 10 cards from Nvidia work differently. Instead of separate pixel and vertex pipelines, they use a unified shader architecture. This means they have a number of general-purpose stream processors that can manipulate both pixel and texture information. If a scene has a lot of vertex information to process, more stream processors will switch to processing vertices, and if there's more pixel information, the card will focus on pixel processing. This makes the card more efficient, as it can balance the load on its processor depending on the kind of scene it is rendering.

AMD's DirectX 10 cards also have a unified shader architecture, but they work in a slightly different way. AMD's 2000-series cards replace pixel and vertex pipelines with stream processor units, or SPUs. These are arranged in blocks of five, each block forming a unified shader unit. This means that although AMD's HD2900XT graphics chip has 320 stream processing units compared with the 128 on Nvidia's GeForce 8800GTX, they are arranged in blocks of five, creating 64 unified shaders.

The final part of a graphics card's layout that affects its performance is the amount of memory it has and how fast it runs. The card uses its memory to store texture information.

When the card's memory is full it has to swap information with the computer's system memory over the PCI Express bus, which is slower than getting the textures straight from the graphics card's memory. The more memory a card has, the less likely it is that this bottleneck will slow down the 3D drawing process.

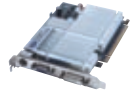
MIXED DOUBLES

All the graphics cards in the group support a dual graphics card technology. AMD cards use a system called CrossFire, and Nvidia's is called SLI. If your motherboard is CrossFire or SLI certified, you can add a second card to increase your computer's 3D performance. Bear in mind that the performance boost varies between games, and support for CrossFire and SLI under Windows Vista isn't perfect yet. You may get better performance from a single, more powerful card.

If you're thinking of buying a powerful graphics card, you should make sure your PC's power supply unit (PSU) is capable of running it. Many cards need an auxiliary six-pin power connector, and you'll need at least a 600W power supply with a pair of six-pin connectors to power the fastest cards in the group. If you want to build a CrossFire or SLI system, you should look for a PSU that has been certified by AMD or Nvidia for use with twin graphics cards. Check <http://ati.amd.com/> and www.slizone.com for lists of certified components.

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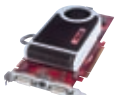
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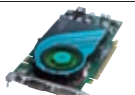
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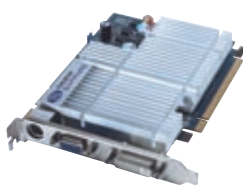
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8800GTX 768MB
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SAPPHIRE HD 2400 XT Silent

★★★★

£45 inc VAT



Sapphire's HD 2400 XT uses AMD's budget HD2400XT chip. Its graphics processor runs at a healthy 700MHz and it has 256MB of memory, but only 40 stream processing units rather than the 120 of AMD's HD2600XT.

The HD 2400 XT is the slowest card in this group, producing very poor frame rates in our tests. Call of Duty 2 and Prey chugged along at 9.2 and 11.2fps, while its 11.9fps in Dark Messiah was also unplayable. We managed to get a playable frame rate of 32.26fps in Dark Messiah by reducing the resolution to 1,024x768 and disabling anti-aliasing, but Call of Duty 2 wouldn't run faster than 19.6fps.

Even if it's no good for gaming, the HD 2400 XT is ideal for building a Windows Vista Media Center PC. It comes with a DVI-to-HDMI adaptor, and had no trouble playing high-definition Blu-ray films. It's also silent. If you want to play HD video rather than games, this is a good choice.

PCI EXPRESS GRAPHICS CARD ATI Radeon HD2400XT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE 11116-00-20R
SUPPLIER www.lambda-tek.com
DETAILS www.sapphiretech.com

- ✓ Cheap; silent
- ✗ Very slow in games

SAPPHIRE X1650 Pro

★★★★

£51 inc VAT



Sapphire's X1650 Pro is a DirectX 9 graphics card with a graphics processor from AMD's previous generation of chips. Unlike newer cards, it uses separate pixel and vertex pipelines rather than stream processing units.

The X1650 Pro has 256MB of DDR3 memory running at 700MHz, and its graphics processor runs at 590MHz. This is similar to Inno3D's GeForce 7600GT, but the X1650 Pro has only four texture processors rather than 12.

Considering its price, the X1650 Pro didn't do badly in our tests. It was faster than the newer Gigabyte GeForce 8500GT and Sapphire HD 2400 XT, but it couldn't manage a playable frame rate in any of our games at the standard settings. However, Call of Duty 2, Prey and Dark Messiah were all playable at a reduced resolution of 1,024x768 with anti-aliasing off.

This card is very cheap and can play current games, but only at low settings. It's likely to struggle significantly with new games, so we recommend buying something more powerful.

PCI EXPRESS GRAPHICS CARD ATI Radeon X1650 Pro chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE 11090-02-20R
SUPPLIER www.kikatek.com
DETAILS www.sapphiretech.com

- ✓ Cheap; can play some games
- ✗ No DirectX 10 support; not very powerful

GIGABYTE GeForce 8500GT

★★★

£58 inc VAT



Gigabyte's GeForce 8500GT is one of the cheapest DirectX 10 graphics cards on test and has a far lower specification than the GeForce 8600GT cards. It has 400MHz DDR2 memory rather than the 8600GT's 700MHz DDR3, only eight texture processors and fewer render outputs and stream processors.

It's too slow for current games, and while it ran our DirectX 10 Call of Juarez benchmark, it managed just 1.7fps. At our standard settings it produced 11.4fps in Call of Duty 2, 15.3fps in Prey and 16.4fps in Dark Messiah, making them far too jerky to play. Prey and Dark Messiah were playable at 1,024x768 with no anti-aliasing, running at 31.1fps and 30.7fps.

If you're on a very tight budget and you want to play only current games, Sapphire's X1650 Pro is a better choice than Gigabyte's GeForce 8500GT. If you want a silent DirectX 10 card for Windows Vista Media Center, Sapphire's HD 2400 XT is cheaper.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8500GT chipset, 256MB DDR2 memory, PCI Express x16 interface
PART CODE GV-NX85T256H
SUPPLIER www.lambda-tek.com
DETAILS www.giga-byte.com

- ✓ Silent
- ✗ Very slow in games

INNO3D GeForce 7600GT

★★★★

£66 inc VAT



Inno3D's GeForce 7600GT is a mid-range card from Nvidia's previous generation of chips, but the launch of Nvidia's new 8000-series range has pushed its price down. It has the same 12 pixel and five vertex pipelines as Sapphire's X1650 Pro, but three times as many texture processors and twice as many render outputs.

Surprisingly, the 7600GT outperformed the next-generation 8600GT-based cards from Asus and MSI in our Call of Duty 2 test, but at 22.6fps it still wasn't playable. Reducing the resolution to 1,024x768 and disabling anti-aliasing increased this to 38.9fps. Prey ran at a playable 43fps at 1,280x1,024 with no anti-aliasing. The card failed our Dark Messiah and 3DMark06 tests, as it doesn't support High Dynamic Range with anti-aliasing enabled.

Inno3D's 7600GT is reasonably powerful and can handle current games if you sacrifice some image quality. It's not much faster than Sapphire's cheaper X1650 Pro, though, and is just as likely to struggle with future titles.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 7600GT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE 1512-1650
SUPPLIER www.pnextday.co.uk
DETAILS www.inno3d.com

- ✓ Can play some current games
- ✗ No DirectX 10 support; not very powerful

HIS X1650XT IceQ Turbo 256MB

★★★★★

£78 inc VAT



HIS's X1650XT is more than an overclocked version of the X1650 Pro. Its X1650XT graphics processor has twice as many pixel pipelines, texture processors and render outputs as the X1650 Pro. The card has an enormous custom cooler, while its graphics processor is overclocked from 575MHz to 630MHz and its memory runs at 730MHz instead of 675MHz.

This card doesn't support DirectX 10 but it was faster than the newer and more expensive GeForce 8600GT cards in our DirectX 9 tests. Prey and Dark Messiah were playable at 1,280x1,024 with 4x anti-aliasing, running at 32fps and 34.5fps. Call of Duty 2 ran at a fairly smooth 34.1fps with anti-aliasing disabled.

The X1650XT can just about play modern games at high detail levels, and is faster and cheaper than the newer GeForce 8600GT cards. For just £16 more, though, you can buy the much faster Sapphire X1950 Pro.

PCI EXPRESS GRAPHICS CARD ATI Radeon X1650XT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE H165XTQT256GDD-R
SUPPLIER www.ebuyer.com
DETAILS www.hisdigital.com

- ✓ Reasonably powerful
- ✗ No DirectX 10 support; X1950 Pro is better value

SAPPHIRE HD 2600 XT

★★★★

£83 inc VAT



Sapphire's HD 2600 XT uses AMD's latest mid-range graphics chip. It has three times as many stream processing units as the HD 2400 XT, and the graphics processor runs 100MHz faster. It also has 256MB of the latest DDR4 memory, but makes do with only four render outputs.

The HD 2600 XT outperformed the similarly priced Asus and MSI GeForce 8600GT cards in our Call of Juarez DirectX 10 benchmark, producing 7.7fps. It also outperformed the Asus card in Call of Duty 2 and Prey with 22.2 and 29.3fps, but managed only 24.4fps in Dark Messiah. Unlike its mid-range Nvidia rivals, the 2600XT produced playable frame rates in all three games once we disabled anti-aliasing.

Sapphire's HD 2600 XT is better value than the Asus and MSI GeForce 8600GT cards. It isn't powerful enough to play DirectX 10 games at high detail settings, though, and is much slower in DirectX 9 games than the Sapphire X1950 Pro.

PCI EXPRESS GRAPHICS CARD ATI Radeon HD2600XT chipset, 256MB DDR4 memory, PCI Express x16 interface
PART CODE 21110-00-20R
SUPPLIER www.lambda-tek.com
DETAILS www.sapphiretech.com

- ✓ More powerful than GeForce 8600GT cards
- ✗ Still not very quick in DirectX 9 or 10 games

ASUS EN8600GT Silent

★★★
£87 inc VAT



Nvidia's GeForce 8600GT chip is more powerful than the 8500GT, with twice as many texture processors, render outputs and stream processors, and faster DDR3 memory. This card has a slower clock speed and memory than MSI's NX8600GT, but it is silently cooled.

The GeForce 7600GT was powerful and good value at the time of its launch, and the 8600GT is disappointing by comparison. It struggled in our Call of Juarez DirectX 10 benchmark, running at just 2.1fps. It fared better in DirectX 9 games, producing 20fps in Call of Duty 2, 26.7fps in Prey and 29.7fps in Dark Messiah. Turning off anti-aliasing produced playable frame rates in all three games, but the card still wasn't as quick as Sapphire's cheaper HD 2600 XT.

The EN8600GT is unlikely to be able to play upcoming DirectX 10 releases at high detail settings, and it's not particularly fast in DirectX 9 games either. At this price, it's poor value.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8600GT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE EN8600GT SILENT/HTDP/256M
SUPPLIER www.lambda-tek.com
DETAILS www.asus.com.tw

- ✓ Silent
- ✗ Not particularly fast

SAPPHIRE X1950 Pro

★★★★★
£94 inc VAT



BUDGET BUY Sapphire's X1950 Pro uses one of ATI's older DirectX 9 graphics processors, so instead of stream processing units it has 36 pixel pipelines and eight vertex pipelines. Its core runs at 580MHz, and it has 256MB of DDR3 memory. Its memory and core speeds are similar to those of Leadtek's WinFast PX7950GT TDH, but it has 12 more pixel pipelines and half as many texture processors.

The X1950's DirectX 9 performance was astounding for a card costing less than £100. It produced a smooth 39.5fps in Call of Duty 2 and ran Prey and Dark Messiah at 45.5fps and 47.1fps at our default settings. Prey and Dark Messiah were even playable at 1,600x1,200 with 4x anti-aliasing enabled.

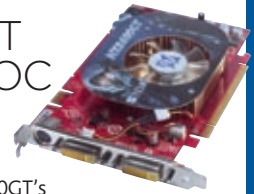
The X1950 Pro won't play forthcoming DirectX 10 games, but it's a fantastic way to get great graphics from current titles. If you don't mind upgrading to a DirectX 10 graphics card at some point in the future, it's a bargain.

PCI EXPRESS GRAPHICS CARD ATI Radeon X1950 Pro chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE 11095-01-20R
SUPPLIER www.kikatek.com
DETAILS www.sapphiretech.com

- ✓ Fast in DirectX 9 games; great value
- ✗ Doesn't support DirectX 10

MSI NX8600GT T2D256E OC

★★★
£95 inc VAT



While the Asus EN8600GT's graphics processor and memory run at the standard speeds set by Nvidia, MSI's NX8600GT is overclocked. Its graphics processor runs at 580MHz rather than 540MHz, and the memory runs at 800MHz.

This overclock is fairly modest, and doesn't make a huge difference to the card's performance. It produced the same 2.1fps as the Asus card in Call of Juarez, and its speeds of 21.9fps in Call of Duty 2 and 31.5fps in Dark Messiah are only slightly faster than the Asus card's. The difference was bigger in our Prey test, where MSI's card was around 5fps faster.

MSI's NX8600GT is a bit faster than Asus's EN8600GT, but it's still not fast enough to run our DirectX 10 benchmark at a reasonable speed. It's also the same price as Sapphire's X1950 Pro, which is much faster in DirectX 9 games. A DirectX 10 card with reasonable performance will cost you twice as much.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8600GT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE NX8600GT-T2D256E-OC
SUPPLIER www.lambda-tek.com
DETAILS www.msi.com.tw

- ✓ Faster than Asus's 8600GT
- ✗ Slow for the price

ASUS EAX1950PRO

★★★★★
£106 inc VAT



The EAX1950PRO is based on AMD's Radeon X1950 Pro graphics processor. It has the same number of pixel pipelines, vertex pipelines, texture processors and render outputs as Sapphire's X1950 card, with a processor that runs at 580MHz and 256MB of DDR2 RAM running at 700MHz.

This card performed almost identically to Sapphire's X1950 Pro in our game tests. It was 0.2fps faster in Call of Duty 2 with 39.7fps, scored an identical 45.5fps in Prey and was 0.2fps faster in Dark Messiah with 47.3fps. All the games were playable at our standard settings. When we increased the resolution to 1,600x1,200, Call of Duty 2 became a little jerky at 29.1fps, but Prey and Dark Messiah were playable at 35fps and 34.7fps.

Like Sapphire's X1950 Pro, Asus's EAX1950PRO is very fast in DirectX 9 games. It doesn't support DirectX 10, but for the moment it'll run any game you throw at it. It's a good card, but Sapphire's X1950 is cheaper.

PCI EXPRESS GRAPHICS CARD ATI Radeon X1950 Pro chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE EAX1950PRO/HTDP/256M/A
SUPPLIER www.idealcomputing.co.uk
DETAILS www.asus.com.tw

- ✓ Fast in DirectX 9 games
- ✗ No DirectX 10 support; Sapphire's X1950 is cheaper

BFG GeForce 8600GTS OC2

★★★
£140 inc VAT



While Nvidia's GeForce 8500GT and 8600GT processors are very different, the 8600GTS is similar to the 8600GT. It has the same number of texture processors, render outputs and stream processors, but they're faster. BFG has also overclocked this card. The graphics processor runs 55MHz faster than normal, and the speed of the 256MB of DDR3 memory has been increased by 130MHz to 1.3GHz.

The 8600GTS was only 0.1fps quicker than the 8600GT-based cards in our Call of Juarez DirectX 10 benchmark, which it ran at 2.2fps. It was around 5fps quicker in Call of Duty and Dark Messiah, running at 25fps and 37.3fps, and much faster in Prey, managing 41.3fps.

This card supports DirectX 10 and is faster than the GeForce 8600GT-based cards. It's not quick enough to be useful in DirectX 10 games, though, and for DirectX 9 games Sapphire's X1950 Pro is far better value.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8600GTS chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE BFG86256GTSOC2FE
SUPPLIER www.scan.co.uk
DETAILS www.bfgtech.com

- ✓ Reasonably quick
- ✗ Poor value

LEADTEK WinFast PX7950GT TDH

★★★★★
£147 inc VAT



Leadtek's WinFast PX7950GT TDH has the same 256MB of DDR2 memory as Inno3D's GeForce 7600GT. The RAM also runs at 700MHz, and the graphics processor's 550MHz is also similar. This card has twice as many pixel pipelines, texture processors and render outputs, though, so it's significantly faster.

The PX7950GT TDH ran Call of Duty 2 and Prey at smooth frame rates of 36.5fps and 47.7fps. It also coped with Prey at 1,600x1,200, running at 35.1fps, but Call of Duty 2 dropped to 26.5fps at this resolution. Nvidia's GeForce 7950 doesn't support anti-aliasing and HDR, so the card failed 3DMark06 and the Dark Messiah test, and with no DirectX 10 support it couldn't run our Call of Juarez benchmark.

The PX7950GT TDH is fast and gives smooth frame rates in DirectX 9 games, but Sapphire's X1950 Pro is cheaper, quicker and supports HDR and anti-aliasing together.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 7950GT chipset, 256MB DDR3 memory, PCI Express x16 interface
PART CODE PX7950GT TDH
SUPPLIER www.XtSI.com
DETAILS www.leadtek.com

- ✓ Fast in DirectX 9 games
- ✗ No DirectX 10 support; expensive

INNO3D 8800GTS 320MB

★★★★★
£180 inc VAT



The GeForce 8800GTS is one of Nvidia's high-end graphics chips. It's quite different to the top-of-the-range 8800GTX, though, with fewer texture processors, render outputs and stream processors. What's more, its stream processors run at 1.19GHz instead of 1.35GHz, its graphics processor is 75MHz slower and it has less memory.

The cheaper DirectX 10 video cards could barely run our Call of Juarez benchmark, but Inno3D's 8800GTS produced a passable 14.9fps. It did well in our DirectX 9 benchmarks, too, producing 51.2fps in Call of Duty 2, 66.5fps in Prey and 57.3fps in Dark Messiah. Higher resolutions were no problem, as the card produced 38.1fps in Call of Duty 2 and over 50fps in Prey at 1,600x1,200.

Inno3D's GeForce 8800GTS is a quick DirectX 9 and 10 graphics card at a reasonable price. We recommend spending a little more on EVGA's much faster 8800GTS, though.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8800GTS chipset, 320MB DDR3 memory, PCI Express x16 interface
PART CODE I-8800GTS-L51TC
SUPPLIER www.pcnexday.co.uk
DETAILS www.inno3d.com
✓ Fast, good value
✗ EVGA's 8800GTS is faster

EVGA 8800GTS ACS3

★★★★★
£200 inc VAT



BEST BUY EVGA's 8800GTS ACS3 uses an overclocked Nvidia GeForce 8800GTS graphics processor, which runs at 590MHz instead of 500MHz. Its DDR3 memory is overclocked to 920MHz, and the stream processors run at 1.45GHz instead of 1.19GHz. EVGA has replaced the standard cooler with its own design that's heavier but no larger.

This is a very fast card for the price. It couldn't match the HD2900XT cards in our Call of Juarez benchmark, but its score of 18fps wasn't far off the pricier Inno3D 8800GTX's 21.9fps. It had no problems with our DirectX 9 games, running Call of Duty 2 at 56.3fps, Prey at 76.9fps and Dark Messiah at 61.7fps, putting it near the top of the group. All three games also ran perfectly at 1,600x1,200.

EVGA's overclocked 8800GTS is almost as fast as cards that cost far more, and it's even fairly fast in DirectX 10. It's a fantastic buy.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8800GTS chipset, 320MB DDR3 memory, PCI Express x16 interface
PART CODE 320-P2-E817-AR
SUPPLIER www.scan.co.uk
DETAILS www.evga.com
✓ Very fast in DirectX 9
✓ Fast in DirectX 10; excellent value

SAPPHIRE HD 2900 XT

★★★★★
£245 inc VAT



The Radeon HD2900XT graphics processor is AMD's late response to Nvidia's GeForce 8800 series. At first glance, it looks as if it should outdo the 8800GTX. It has 320 stream processing units compared with the 8800GTX's 128 stream processors, and a higher clock speed. However, the HD2900XT's stream processors run at the same speed as the graphics chip, while the 8800GTX's run at 1.35GHz.

All three HD2900XT cards did well in Call of Juarez, beating their Nvidia counterpart. The Sapphire HD 2900 XT card was the quickest, though, producing 25.9fps. It couldn't match the 8800GTX or even EVGA's cheaper 8800GTS in Call of Duty 2 or Dark Messiah, but it was 5fps quicker in Prey with 82.1fps.

Sapphire's HD 2900 XT is the cheapest and fastest Radeon HD2900XT card in the group. It has lots of potential for future DirectX 10 games, but its extra performance isn't worth the cost over EVGA's cheaper 8600GTS ACS3.

PCI EXPRESS GRAPHICS CARD ATI Radeon HD2900XT chipset, 512MB DDR3 memory, PCI Express x16 interface
PART CODE 21108-00-10R
SUPPLIER www.dabs.com
DETAILS <http://ati.amd.com>
✓ Very fast in DirectX 10
✗ Expensive

HIS Radeon HD2900XT

★★★★★
£248 inc VAT



Unlike its overclocked X1650XT, HIS's Radeon HD2900XT is based on a standard design. Like the Nvidia 8800GTS and 8800GTX cards it has a huge cooler, so it takes up two slots in your PC case. Cards based on the HD2900XT chip have two power sockets – one six-pin and one eight-pin – both of which must be filled. We've only ever seen one power supply with an eight-pin PCI Express connector, but we found that a standard six-pin plug fitted in the eight-pin socket and worked perfectly.

This card has only 512MB of memory, compared with the Inno3D 8800GTX's 768MB, but it has a wider 512-bit memory interface. Its graphics processor is also much faster, running at 742MHz, but its stream processing units are far slower. It was the second fastest in our Call of Juarez test, running at a fairly smooth 24fps, but it couldn't match EVGA's cheaper 8800GTS in most DirectX 9 games. Sapphire's HD 2900 XT is quicker, and EVGA's 8800GTS is a better buy overall.

PCI EXPRESS GRAPHICS CARD ATI Radeon HD2900XT chipset, 512MB DDR3 memory, PCI Express x16 interface
PART CODE H290XT512DV-R
SUPPLIER www.scan.co.uk
DETAILS www.hisdigital.com
✓ Fast in DirectX 10
✗ Expensive

ASUS EAH2900XT

★★★★★
£249 inc VAT



While the HIS and Sapphire HD2900XT cards are standard AMD designs with a company logo stuck on the fan, Asus has thoroughly branded the EAH2900XT with a huge sticker advertising the annoyingly titled game S.T.A.L.K.E.R. A full copy of the game is provided in the box and, as with the other HD2900XT cards from Sapphire and HIS, you also get a voucher for Valve's Black Box games collection. This will enable you to download full versions of Half-Life 2: Episode 2, Team Fortress 2 and Portal for free when they're released.

Even though all three HD2900XT cards here are based on a common design, we spotted some performance differences in our benchmarks. The Asus card was the slowest HD2900XT in the group when playing Call of Juarez, producing 23.8fps. It was also slightly slower in Call of Duty 2, at 55fps, and Prey, at 80.9fps. These scores are very fast, but the EAH2900XT costs £49 more than EVGA's similarly performing 8800GTS.

PCI EXPRESS GRAPHICS CARD ATI Radeon HD2900XT chipset, 512MB DDR3 memory, PCI Express x16 interface
PART CODE EAH2900XT/HTVDI/512M
SUPPLIER www.lambda-tek.com
DETAILS www.asus.com.tw
✓ Fast in DirectX 10
✗ Expensive

INNO3D 8800GTX 768MB

★★★★★
£352 inc VAT



HOTTEST The 8800GTX graphics processor is hugely powerful, and this card needs a lot of power. You'll need a power supply with two six-pin PCI Express power connectors and sufficient wattage to power the card. There's an incredible 768MB of DDR3 memory on board running at 900MHz.

Although the card's GeForce 8800GTX graphics processor runs more slowly than AMD's HD2900XT chip, and has only 128 stream processors compared with the 320 on AMD's flagship, the stream processors run at nearly twice the speed.

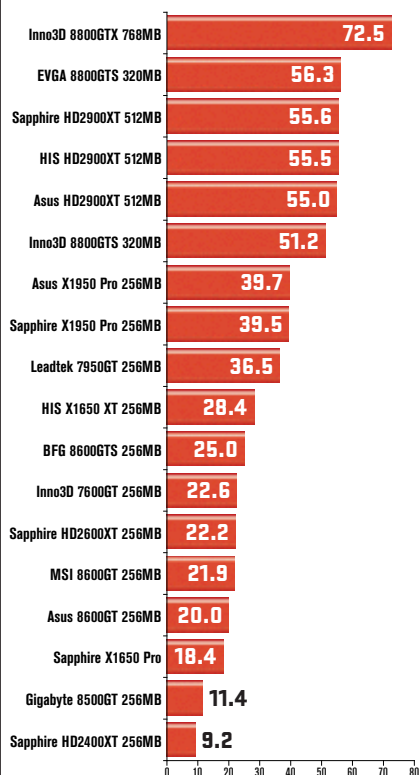
This helps to explain its astonishing performance in our DirectX 9 benchmarks. It was 16fps faster than its nearest rival in Call of Duty 2, and easily the fastest in Prey and Dark Messiah. It couldn't match the AMD cards in Call of Juarez, though, running around 4fps behind the quickest. This card is astonishingly fast in today's games, and quick in DirectX 10, too, but it's far too expensive for most gamers.

PCI EXPRESS GRAPHICS CARD Nvidia GeForce 8800GTX chipset, 768MB DDR3 memory, PCI Express x16 interface
PART CODE I-8800GTX-K5JTC
SUPPLIER www.pcnexday.co.uk
DETAILS www.inno3d.com
✓ Almost ludicrously fast
✗ Very expensive

BENCHMARKS

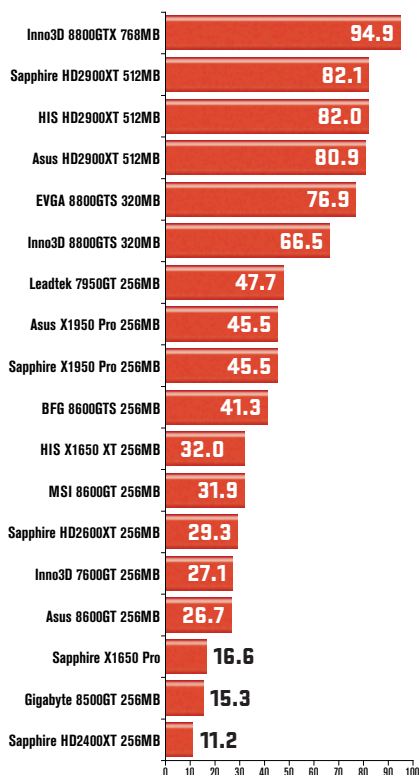
3D performance Games

Call of Duty 2 (fps)



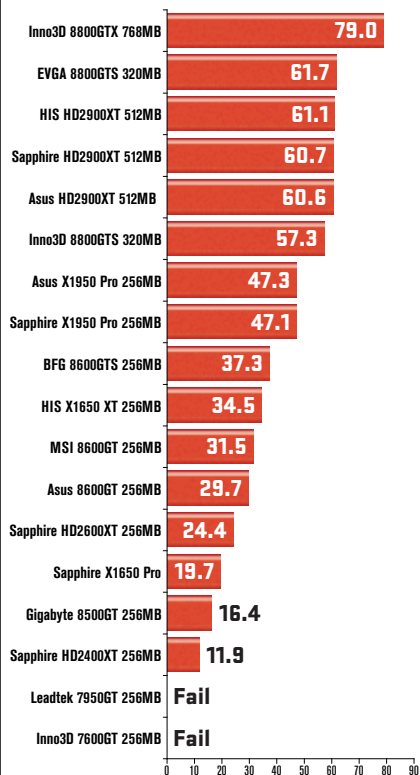
SETTINGS 1,280x1,024 resolution, 4x AA, Anisotropic filtering WEB www.callofduty.com

Prey (fps)



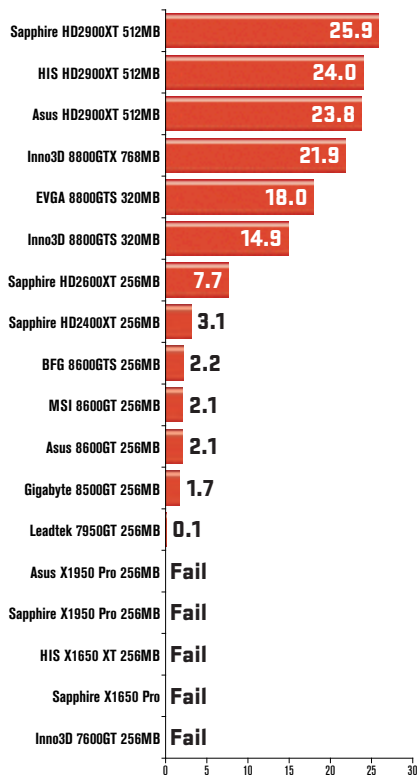
SETTINGS 1,280x1,024 resolution, 4x AA, Anisotropic filtering WEB www.prey.com

Dark Messiah (fps)



SETTINGS 1,280x1,024 resolution, 4x AA, AF WEB www.darkmessiahgame.com

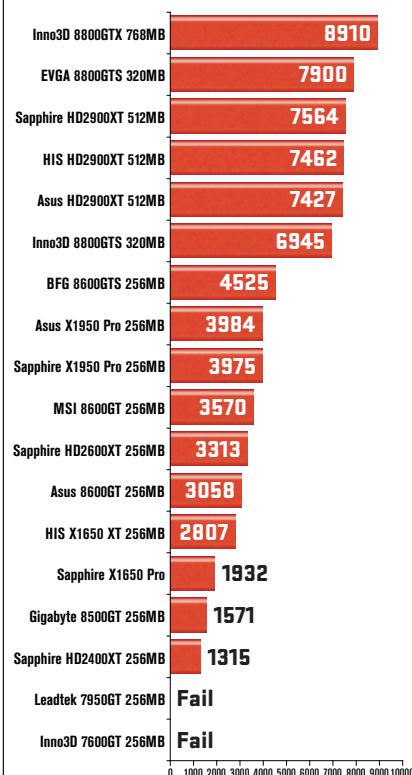
Call of Juarez (fps)



SETTINGS 1,280x1,024 resolution, 4x AA, Anisotropic filtering WEB www.coj-game.com

3D Performance 3DMark06

3DMark06



Labs verdict Graphics cards

Which graphics card you should choose depends on whether you want to play DirectX 10 games. DirectX 10 should bring better graphics to future titles, but most forthcoming titles are expected to support DirectX 9 as well. To use DirectX 10, you'll need a PC running Windows Vista.

If you're happy with DirectX 9 support, Sapphire's X1950 Pro is the card to buy. It runs current games beautifully and costs just £94, so it wins a Budget Buy award.

To get a card that performs well in DirectX 10 you'll need to pay twice as much, but EVGA's 8800GTS ACS3 is a great buy nonetheless. It's astoundingly fast in current games, and runs well in DirectX 10, too. It's our Best Buy.

SAPPHIRE X1950 Pro
★★★★★

EVGA 8800GTS ACS3
★★★★★

INNO3D 8800GTX 768MB
★★★★★

BUDGET BUY									
MANUFACTURER	SAPPHIRE	SAPPHIRE	GIGABYTE	INNO3D	HIS	SAPPHIRE	ASUS	SAPPHIRE	MSI
Model	HD 2400 XT Silent	X1650 Pro	GeForce 8500GT	GeForce 7600GT	X1650XT IceQ Turbo 256MB	HD 2600 XT	EN8600GT Silent	X1950 Pro	NX8600GT T2D256E OC
Rating	★★★	★★★	★★	★★★	★★★★	★★★	★★	★★★★	★★
Interface	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16
CrossFire/SLI compatible	CrossFire	CrossFire	SLI	SLI	CrossFire	CrossFire	SLI	CrossFire	SLI
Number of slots taken up	1	1	1	1	2	1	2	1	1
Processor	ATI Radeon HD2400XT	ATI Radeon X1650 Pro	Nvidia GeForce 8500GT	Nvidia GeForce 7600GT	ATI Radeon X1650XT	ATI Radeon HD2600XT	Nvidia GeForce 8600GT	ATI Radeon X1950 Pro	Nvidia GeForce 8600GT
Memory	256MB DDR3	256MB DDR3	256MB DDR2	256MB DDR3	256MB DDR3	256MB DDR4	256MB DDR3	256MB DDR3	256MB DDR3
Memory interface	64-bit	128-bit	128-bit	128-bit	128-bit	128-bit	128-bit	256-bit	128-bit
GPU speed	700MHz	590MHz	500MHz	560MHz	630MHz	800MHz	540MHz	580MHz	580MHz
Memory speed	700MHz	700MHz	400MHz	700MHz	730MHz	550MHz	700MHz	700MHz	800MHz
FEATURES									
Processors/pipelines	4 render outputs, 40 stream processing units (700MHz)	12 pixel pipelines, 5 vertex pipelines, 4 texture processors, 4 render outputs	8 texture processors, 4 render outputs, 16 stream processors (900MHz)	12 pixel pipelines, 5 vertex pipelines, 12 texture processors, 8 render outputs	24 pixel pipelines, 8 vertex pipelines, 8 texture processors, 8 render outputs	4 render outputs, 120 stream processing units (800MHz)	16 texture processors, 8 render outputs, 32 stream processors (1.19GHz)	36 pixel pipelines, 8 vertex pipelines, 12 texture processors, 12 render outputs	16 texture processors, 8 render outputs, 32 stream processors (1.19GHz)
Shader Model support	4	3	4	3	3	4	4	3	4
Anti-aliasing	8x	6x	16x	8x	6x	8x	16x	6x	16x
Anisotropic filtering	16x	16x	16x	16x	16x	16x	16x	16x	16x
CONNECTORS									
DVI outputs	1	2	1	2	2	2	2	2	2
D-sub outputs (analogue)	1	None	1	None	None	None	None	None	None
S-video output	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes
S-video input	No	No	No	No	No	No	No	No	No
Composite output	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Composite input	No	No	No	No	No	No	No	No	No
Component output	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HDMI output	Yes	No	No	No	No	Yes	No	No	No
Power leads required	None	None	None	None	None	None	None	1x 6-pin PCI Express	None
EXTRAS									
Accessories	DVI-to-D-sub adaptor, DVI-to-HDMI adaptor, composite adaptor, component breakout	2x DVI-to-D-sub adaptor, composite lead, component breakout	Composite/S-video/component breakout box	DVI to D-sub adaptor, component breakout, S-video lead	DVI to D-sub adaptor, component lead, S-video lead, composite adaptor	2x DVI-to-D-sub adaptor, DVI-to-HDMI adaptor, component breakout	DVI-to-D-sub adaptor, component breakout	2x DVI-to-D-sub adaptor, S-video lead, composite lead, component breakout	2x DVI-to-D-sub adaptor, component/S-video lead, S-video cable
Bundled software	None	None	Dawn of War: Dark Crusade	CyberLink PowerDVD 6, CyberLink PowerDirector 4	CyberLink DVD Solution 4, Dungeon Siege	None	None	None	None
BUYING INFORMATION									
Warranty	Two years RTB	Two years RTB	Two years RTB	One year RTB	Three years RTB	Two years RTB	Three years RTB	Two years RTB	Two years RTB
Price inc/VAT	£45	£51	£58	£66	£78	£83	£87	£94	£95
Supplier	www.lambda-tek.com	www.kikatek.com	www.lambda-tek.com	www.pcnextday.co.uk	www.ebuyer.com	www.lambda-tek.com	www.lambda-tek.com	www.kikatek.com	www.lambda-tek.com
Details	www.sapphiretech.com	www.sapphiretech.com	www.giga-byte.com	www.inno3d.com	www.hisdigital.com	www.sapphiretech.com	www.asus.com.tw	www.sapphiretech.com	www.msi.com.tw
Part code	11116-00-20R	11090-02-20R	GV-NX85T256H	1512-1650	H165XTQT 256GDD-R	21110-00-20R	EN8600GT SILENT/HTDP/256M	11095-01-20R	NX8600GT-T2D256E-OC

BEST BUY									
MANUFACTURER	ASUS	BFG	LEADTEK	INNO3D	EVGA	SAPPHIRE	HIS	ASUS	INNO3D
Model	EAX1950PRO	GeForce 8600GTS OC2	WinFast PX7950GT TDH	8800GTS 320MB	8800GTS ACS3	HD 2900 XT	Radeon HD2900XT	EAH2900XT	8800GTX 768MB
Rating	★★★★	★★	★★★★	★★★★	★★★★★	★★★	★★★	★★★	★★★★
Interface	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16
CrossFire/SLI compatible	CrossFire	SLI	SLI	SLI	SLI	CrossFire	CrossFire	CrossFire	SLI
Number of slots taken up	1	1	1	2	2	2	2	2	2
Processor	ATI Radeon X1950 Pro	Nvidia GeForce 8600GTS	Nvidia GeForce 7950GT	Nvidia GeForce 8800GTS	Nvidia GeForce 8800GTS	ATI Radeon HD2900XT	ATI Radeon HD2900XT	ATI Radeon HD2900XT	Nvidia GeForce 8800GTX
Memory	256MB DDR3	256MB DDR3	256MB DDR3	320MB DDR3	320MB DDR3	512MB DDR3	512MB DDR3	512MB DDR3	768MB DDR3
Memory interface	256-bit	128-bit	256-bit	320-bit	320-bit	512-bit	512-bit	512-bit	384-bit
GPU speed	580MHz	730MHz	550MHz	500MHz	590MHz	742MHz	742MHz	742MHz	575MHz
Memory speed	700MHz	1.13GHz	700MHz	800MHz	920MHz	828MHz	828MHz	828MHz	900MHz
FEATURES									
Processors/pipelines	36 pixel pipelines, 8 vertex pipelines, 12 texture processors, 12 render outputs	16 texture processors, 8 render outputs, 32 stream processors (1.45GHz)	24 pixel pipelines, 8 vertex pipelines, 24 texture processors, 16 render outputs	24 texture processors, 20 render outputs, 96 stream processors (1.19GHz)	24 texture processors, 20 render outputs, 96 stream processors (1.45GHz)	16 render outputs, 320 stream processing units (742MHz)	16 render outputs, 320 stream processing units (742MHz)	16 render outputs, 320 stream processing units (742MHz)	32 texture processors, 24 render outputs, 128 stream processors (1.35GHz)
Shader Model support	3	4	3	4	4	4	4	4	4
Anti-aliasing	6x	16x	8x	16x	16x	8x	8x	8x	16x
Anisotropic filtering	16x	16x	16x	16x	16x	16x	16x	16x	16x
CONNECTORS									
DVI outputs	2	2	2	2	2	2	2	2	2
D-sub outputs (analogue)	None	None	None	None	None	None	None	None	None
S-video output	No	No	Yes	No	Yes	Yes	Yes	Yes	No
S-video input	No	No	No	No	No	Yes	No	Yes	No
Composite output	No	No	No	Yes	No	Yes	No	Yes	Yes
Composite input	No	No	No	No	No	Yes	No	Yes	No
Component output	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
HDMI output	No	No	No	No	No	Yes	Yes	Yes	No
Power leads required	1x 6-pin PCI Express	1x 6-pin PCI Express	1x 6-pin PCI Express	1x 6-pin PCI Express	1x 6-pin PCI Express	2x 6-pin PCI Express	2x 6-pin PCI Express	2x 6-pin PCI Express	2x 6-pin PCI Express
EXTRAS									
Accessories	DVI-to-D-sub adaptor, component breakout	2x DVI-to-D-sub adaptor, component breakout	S-video/component breakout cable	2x DVI-to-D-sub adaptor, component lead, composite lead	2x DVI-to-D-sub adaptor, component lead, S-video lead	2x DVI-to-D-sub adaptor, DVI-to-HDMI adaptor, S-video/composite input/output breakout	2x DVI-to-D-sub adaptor, DVI-to-HDMI adaptor, S-video/component output, S-video lead	2x DVI to D-sub adaptor, DVI-to-HDMI adaptor, S-video/composite input/output breakout	2x DVI-to-D-sub adaptor, component lead, composite lead
Bundled software	None	None	Serious Sam II, SpellForce II	WTCC Race	None	CyberLink PowerDVD 6, CyberLink PowerDirector 4, FutureMark 3DMark06, voucher for Black Box games collection	CyberLink DVD Solution 4, Dungeon Siege, voucher for Black Box games collection	Stalker, voucher for Black Box games collection	WTCC Race
BUYING INFORMATION									
Warranty	Three years RTB	Lifetime	Two years RTB	One year RTB	Lifetime	Two years RTB	Three years RTB	Three years RTB	One year RTB
Price inc/VAT	£106	£140	£147	£180	£200	£245	£248	£249	£352
Supplier	www.idealcomputing.co.uk	www.scan.co.uk	www.xtstf.com	www.pcnextday.co.uk	www.scan.co.uk	www.dabs.com	www.scan.co.uk	www.lambda-tek.com	www.pcnextday.co.uk
Details	www.asus.com.tw	www.bfgtech.com	www.leadtek.com	www.inno3d.com	www.evga.com	http://ati.amd.com	www.hisdigital.com	www.asus.com.tw	www.inno3d.com
Part code	EAX1950PRO/HTDP/256M/A	BFG86256 GTSOC2FE	PX7950GT TDH	I-8800GTS-L51TC	320-P2-E817-AR	21108-00-10R	H290XT512DV-R	EAH2900XT/HTVDI/512M	I-8800GTX-K5JTC